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Differential scanning calorimetry based peculiarities of self-organization of crystalline structures of heavy oil under hydrothermal treatment

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© SGEM2018. Heavy crudes and natural bitumen might present one of the accessible energy resources for the period of time necessary for the adoption of novel energy technologies of the future. Their development is characterized with low profitability, due to peculiarities of composition, mainly high content of high-molecular paraffin, resin and asphaltenes. At the present time in exploration of heavy hydrocarbon resources, thermal methods of production are being given more attention to. One of the key problems of thermal methods related to production of heavy crudes with high concentration of paraffin wax is precipitation of asphalt-resin-paraffin deposits in the formation and in oilfield equipment. In the present work the peculiarities of redistribution of saturated hydrocarbons between the initial crude and asphalt-resin-paraffin deposits produced under thermal steam treatment were investigated. Qualitative composition of components of deposits, melting point and dissolving capacity of hydrocarbon phase were characterized by thermal analysis. On the curves of heat flow moments of appearance and disappearance of crystalline phase of paraffin wax were detected. The amount of crystalline phase in the examined deposits was estimated by crystallization enthalpy data. Slight difference in melting and crystallization enthalpy during heating and cooling was observed, which indicated the formation of crystalline phase. The presence of low-molecular n-alkanes in asphaltenes of asphalt-resin-paraffin deposits point out to their participation in the formation of nucleation sites.

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Keywords

Asphalt-resin-paraffin deposits, Asphaltene, Calorimetry, Crystalline phase, Heavy oil, Thermal analysis

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